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FIRST RECORD OF SOME PERITRICHS CILIATES FOR SAN MIGUEL DEL MONTE POND (BUENOS AIRES, ARGENTINA)*

*PRIMER REGISTRO DE ALGUNOS CILIADOS PERITRICOS DE LA LAGUNA DE SAN MIGUEL DEL MONTE (BUENOS AIRES, ARGENTINA)**

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ABSTRACT

Peritrichs attached to submerged macrophytes, filamentous chlorophytes and debries have been found in San Miguel del Monte pond (Buenos Aires province, Argentina) during the period March 1998- March 1999. Specimens were identified, illustrated and measured alive. Fourteen species of Subclass Peritrichia new for the country are described, illustrated and commented: *Epistylis hentscheli, E. tubificis, E. vestita, Opercularia elongata, Cothurnia annulata, Cothurniopsis valvata, Pyxicola limbata, Thuricola innixa, Th. kellicotiana, Vaginicola attenuata, Vorticella picta, V. pulchella, V. rotunda* and *Zoothamnium ramosissimum.*

Keywords: Ciliates, peritrichs, first record, pampasic pond, San Miguel del Monte, Argentina

RESUMEN

Peritricos adheridos a macrófitas acuáticas, clorofitas filamentosas y partículas fueron hallados en la laguna de San Miguel del Monte (provincia de Buenos Aires, Argentina) durante el período marzo 1998 - marzo 1999. Los especímenes fueron identificados, dibujados y medidos *in vivo*. Se brinda una breve descripción, ilustración y algunos comentarios de catorce especies de la subclase Peritrichia, nuevas para el país: *Epistylis hentscheli, E. tubificis, E. vestita, Opercularia elongata, Cothurnia annulata, Cothurniopsis valvata, Pyxicola limbata, Thuricola innixa, Th. kellicotiana, Vaginicola attenuata, Vorticella picta, V. pulchella, V. rotunda* y *Zoothamnium ramosissimum.*

Palabras claves: ciliados, petricos, primer registro, laguna pampásica, San Miguel del Monte, Argentina.

INTRODUCTION

The majority of ciliates are considered to be cosmopolitan organisms (Curds, 1992), though this statement can not be completely confirmed due to the small amount of distributional information provided in the literature.

Peritrichs have been widely revised by researchers such as Noland & Finley (1931), Nenninger (1948), Stiller (1971), Warren (1982, 1986, 1987) and Warren & Paynter (1991). Thus, very much is known about their taxonomy, but few descriptions are accompanied with distributional and biological data.

In the Neotropical region, the ciliate fauna has been scarcely studied. From recent years, some papers can be mentioned (Claps & Modenutti 1988; Foggetta & Boltovskoy 1995; Modenutti 1997) and only few papers are completely dedicated to the Peritrichia considering taxonomic (Vucetich & Escalante 1979; Claps & Modenutti 1984, 1988; Modenutti & Claps 1986) and biological aspects (Queimaliños *et al.* 1999).

This contribution to the knowledge of the peritrich fauna of Argentina is based on the study of the microfauna associated to submerged macrophytes, filamentous chlorophytes and debries from the San Miguel del Monte pond, located in the pampean region (Province of Buenos Aires). Fourteen species of peritrichs are recorded for the first time for the country. Brief descriptions and illustrations, as well as available distributional information, substrata preference and occurrence, are provided.

MATERIAL AND METHODS

Samples of different substrates were collected during the period March 1998 - March 1999 and kept in aquarium in the laboratory for analysis. Some physical and chemical parameters were measured *in situ*; total phosphorus and NO_2 - N + NO_3 - N -concentrations were determined following the methodology proposed by APHA (1995).

The organisms were identified, measured and illustrated alive, following the methodology recommended by Lee *et al.* (1985). The systematic scheme proposed by Small & Lynn (1985) was followed.

All measures are expressed in micra; minimum and maximum values are between brackets.

RESULTS AND DISCUSSION

The pond showed moderated alkaline water (average pH 8,96), low transparency, low depth (maximum 2 m) and average conductivity of 1527,5 µS cm^{-1}. Concentration of NO_2 + NO_3 had a marked declination during the summer period, with a possible desnitrification in November, when dissolved oxygen deficit was recorded. Dissolved oxygen concentration fluctuated during the sampling period, with moments of deficit (March and November 1998) and supersaturation (July, October 1998 and January 1999). Total phosphorus values ranged between 73,5-294 µg l^{-1}, average 194,5 µg l-1 (Table I).

Table I. Physical and chemical parameters measured during the sampling period in San Miguel del Monte pond.

	March 98	May 98	July 98	August 98	October 98	November 98	January 99	March 99
pH	9.07	10.2	8.79	9	9.35	9.05	8.43	7.8
Temperature (ºC)	17	15	11.9	12.4	22	20	26	27.5
Total phosphorus ($\mu g\ l^{-1}$)	294	182.4	229.9	135.3	147.1	255	73.5	239
NO_3-N +NO_3-N ($\mu g\ l^{-1}$)	132	100.7	85.8	80.9	113.7	57	69	73
Dissolved O_2 ($mg\ l^{-1}$)	3.16	7.2	11.12	7.9	11.2	1	10	6.2
O_2 Saturation (%)	33	71	103	72	135	11	125	76
Transparency (cm)	45	50	65	48	38	65	90	72
Conductivity ($\mu S\ cm^{-1}$)	1630	1550	1450	1410	1410	1460	1560	1750
Salinity (%)	0.07	0.06	0.06	0.06	0.06	0.06	0.07	0.08

Emergent and submersed macrophytes are present, the former being *Scirpus californicus* and the latter *Myriophyllum quitense*, *Potamogeton pectinatus* and *Ceratophyllum demersum*. There are, as well, floating macrophytes such as *Azolla filiculoides*, *Spirodella* sp., *Wolffia* sp., *Wolfiella* sp. and *Lemna* sp.

Phyllum Ciliophora
Subphyllum Cyrtophora
Class Oligohymenophorea
Subclass Peritrichia
Order Sessilida
Family Epistylidae

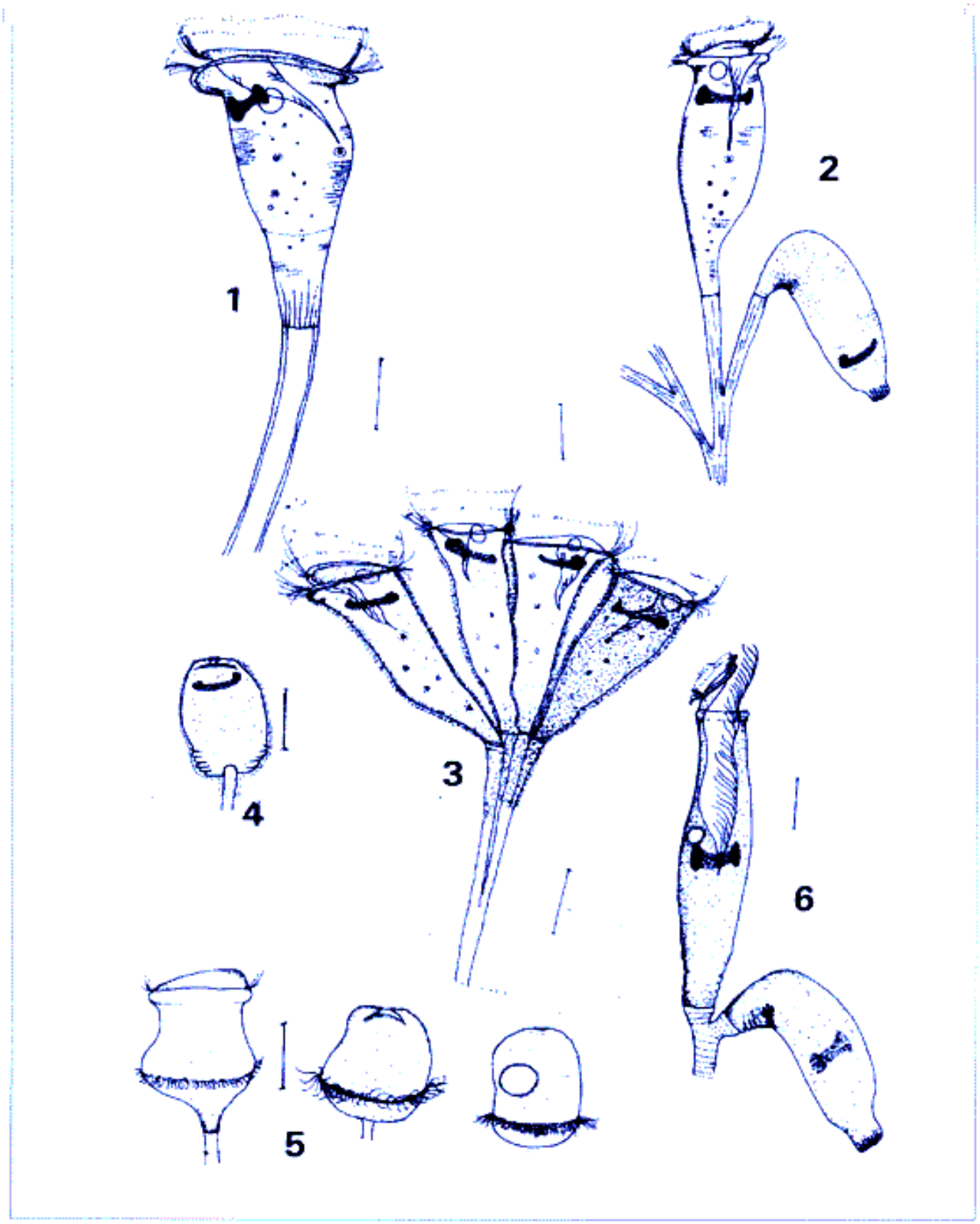
Epistylis hentscheli Kahl 1930 (Fig. 1)

Freshwater solitary peritrich; pyriform in outline. Pellicle finely striated. Peristomal disc not prominently elevated. Maximum width is measured across the peristomal lip; zooid strongly constricted beneath this area. Macronucleus horse shoe shaped, transversal. Large infundibulum, in the upper third of body, with almost transversal disposition crossing most of zooids width; infundibular ciliature hardly observable. Cytoplasm with numerous digestive vacuoles and granules. During contraction, the zooids turn globular, with basal folds. Stalk refringent, empty in appearence.

Observations: this species was found attached to the chlorophyte *Enteromorpha* sp. and in plankton samples attached to debries in summer. According to Kahl (1930-1935), it was a frequent species on

artificial substrates Hamburg's Port. Rustige (1995) found it on artificial substrates. Nolting & Rustige (1998) found *E. henstcheli* in some tributaries of the river Weser system (Fulda, Aller, headwaters and middle course of river Weser, Germany).

Measurements: (n=1) maximum body length 113.6µ; peristome width 77.3µ; maximum body width 49.9µ; stalk length 279µ; stalk width 13.6µ.



FIGURES 1-6. **1.** *Epistylis hentscheli*, **2.** *Epistylis tubificis*, **3.** *Epistylis vestita*, **4.** contracted zooid of *E. vestita*, **5.** telotroch formation of *E. vestita*, **6.** *Opercularia elongata*. Scales: 30 µm (Figs. 1, 3, 4); 20 µm (Figs. 2, 6).

Epistylis tubificis D' Udekem 1864 (Fig. 2)

Freshwater, colonial espistylid. Zooid cylindrical, narrower in the joint with the peduncule. Pellicle finely striated. Macronucleus "C" shaped, transversal, in the upper third of body. Peristomal disc convex, arched. Cytoplasm hyaline, with numerous small digestive vacuoles. Infundibulum reaches half of body length; with conspicuous ciliature. Contractile vacuole beneath the peristomal lip, next to the infundibulum. Peduncule longitudinally striated; dichotomously branched. Colonies with 6-10 individuals. During contraction, zooids assume a nodding position; peristome withdraws and acquires "snout" shape.

Observations: The peritrich was originally described as an epibiont on *Tubifex* sp. The species was found attached in summer to *M. quitense*, filamentous chlorophyte *Oedogonium* sp. and *Enteromorpha* sp.

Measurements: (n=6) average maximum body length: 93.1µ (77.3µ-113.6µ); average peristome width 31.4µ (27.4µ-34.1µ); average maximum body width 28.4µ (22.7µ-34.1µ); average stalk length 238µ (190µ-286µ); stalk width 9.1µ.

Epistylis vestita Stokes 1887 (Figs. 3, 4, 5)

Freshwater, colonial peritrich. Zooids funnel-shaped; covered with mucilaginous, granular material, including terminal branches of stalk; peristomal disk softly elevated and convex, not covered by mucilaginous membrane. Transversal horseshoe-like macronucleus, in the upper third of body. Single contractile vacuole proximal to the macronucleus, beneath the peristomal lip. Infundibulum reaches half of body length, with conspicuous ciliature. Cytoplasm with numerous greenish digestive vacuoles. Stalk long, several times the zooids length, unstriated. During contraction, the zooids turn globular, with basal folds. Asexual reproduction was observed, resulting on a globular telotroch.

Observations: According to Kahl (1930-1935), stalk striations should be noticed. The species was found attached to *M. quitense* in summer.

Measurements: (n=14) average maximum body length: 98.31µ (86.3µ-109.1µ); average peristome width 42.3µ (36.4µ-49.9µ); average maximum body width 29.87µ (22.7µ-36.4µ); average stalk length 269.24µ (223µ-316.2µ); telotroch length 45µ.

Family Operculariidae

Opercularia elongata Kellicott 1884 (Fig. 6)

Large colonial peritrich. Zooids cylindrical, elongated. Pellicle granular, without striations. Peristomal disc elevated, oblique, with conspicuous undulating membrane and ciliation. Infundibulum wide, reaches half of zooids length. Single contractile vacuole beneath the infundibulum. Macronucleus horse shoe-like, transversal, centrally located. Stalk with transversal annulations, dichotomous; terminal branches short,

slightly wider in the joint with the zooid. During contraction the zooids assume a pendular or "nodding" position; peristome withdraws and acquires "snout" shape. Colonies with 8-12 individuals.

Observations: Specimens were found attached to *M. quitense* and *Enteromorpha* sp. in summer.

Measurements: (n=16) average maximum body length: 125.1µ (109.1µ-136.4µ); average maximum body width 25.7µ (22.7µ-28.2µ); average peristomal disc width 22.3µ (20.4µ-22.7µ); average peristomal disc height 22.6µ (18.2µ-27.3µ); average peristomal lip width 21.2µ (18.2µ-22.7µ); average stalk length 134.1µ (109.1µ-159.1µ); stalk width 9.1µ; average terminal branch length 5.4µ; average terminal branch width 15.2µ (13.6µ-18.2µ).

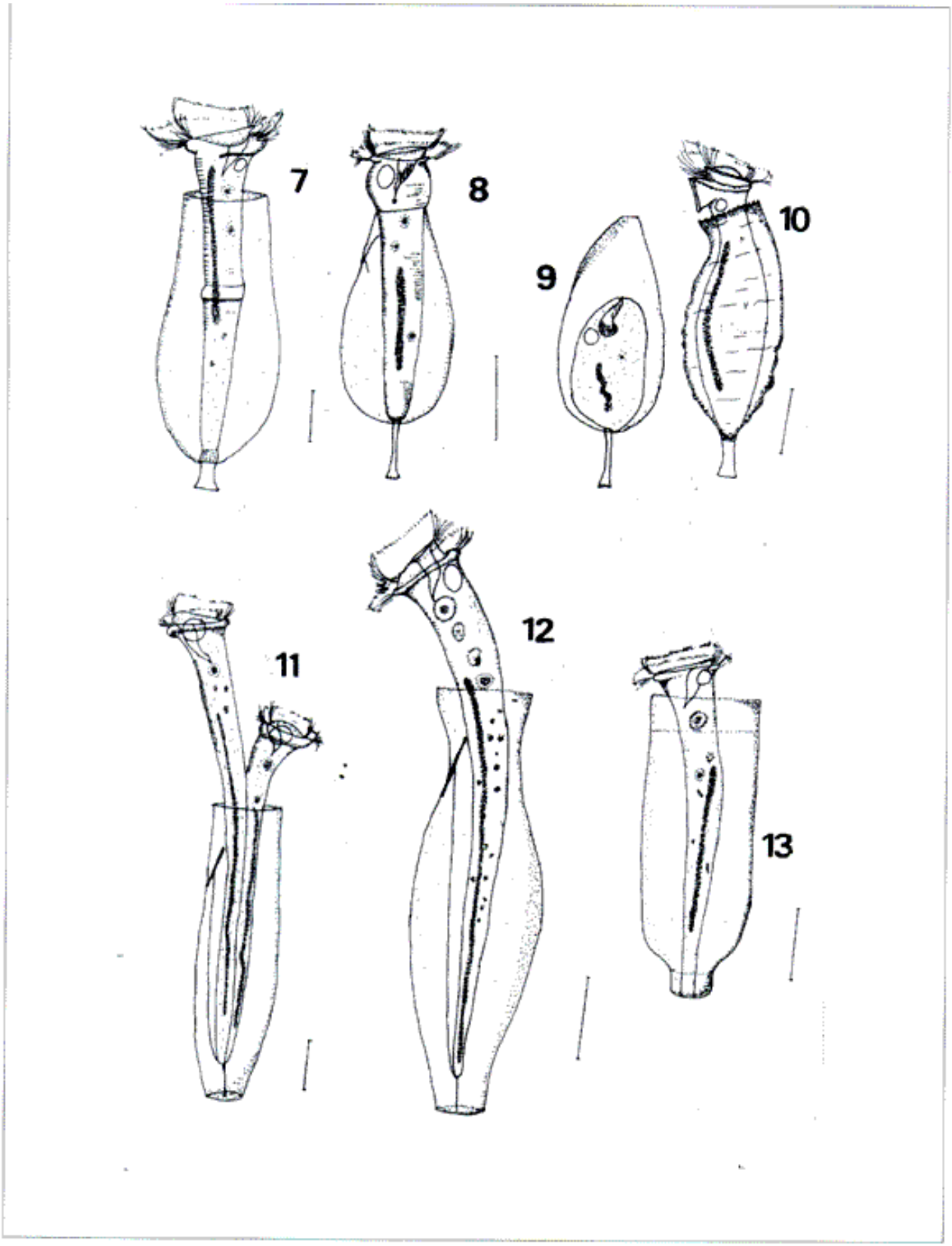
Family Vaginicollidae

Cothurnia annulata Stokes 1885 (Fig. 7)

Freshwater, solitary, loricated peritrich. Lorica vase-like, transparent, with rounded posterior ending. External stalk short, expanded at the base. Zooid slender, attached to the lorica by a short internal stalk or endostyle. Pellicle striated; single central annular ridge. Contractile vacuole beneath the peristomal lip. Peristomal disc notorious, slightly arched. Macronucleus band-like, longitudinal.

Observations: This species was found attached to *M. quitense*, *Oedogonium* sp., the tube of Floscullariacean rotifer *Lymnias cerathophylli* and stalk of the sessile peritrich *Campanella umbellaria* around the year. It was originally isolated from North American ponds attached to *Myriophyllum* sp. (Warren & Paynter 1991). Sommer (1951) found it as epiphytic of littoral macrophytes and chlorophytes. Rustige (1995) found it on periphytic algae.

Measurements: (n=8) Zooids: average maximum body length: 66.2µ (59.1µ-77.3µ); average peristome width 18µ (15.9µ-19µ). Lorica: average length 52.8µ (45.4µ-59µ); average aperture width 17.6µ (15.4µ-20.4µ); average maximum width 22µ (19µ-23µ); average stalk length 5.1µ (4.7µ-5.5µ).



FIGURES 7-13. **7.** *Cothurnia annulata*, **8.** *Cothurniopsis valvata*, **9.** contracted zooid of *C. valvata*, **10.** *Pyxicola limbata*, **11.** *Thuricola innixa*, **12.** *Thuricola kellicotiana*, **13.** *Vaginicola attenuata*. Scales: 10 µm (Fig. 7), 20 µm (Figs. 8, 9, 10, 13), 30 µm (Figs. 11, 12).

Cothurniopsis valvata (Stokes 1893) (Figs. 8, 9)

Small freshwater loricated peritrich. Borders of lorica pliable and used to close the aperture when the ciliate contracts. Lorica pyriform, transparent, rounded posteriorly. External stalk short. Zooid exposing the anterior 1/5 of body when fully extended. The aperture of the lorica is narrow, constricting the ciliate when extended, so that it seems to have a "head" and "neck". Peristomal disc strongly convex. Pellicle finely striated. Contractile vacuole beneath the peristomal lip. Infundibulum short, with conspicuous ciliature. Longitudinal band-like macronucleus, in the lower half of body.

Observations: Specimens were found attached to *Oedogonium* sp. and debries in summer. The species was originally found on filamentous algae from Coney Island, New York, USA, and isolated from moss in Europe (Warren & Paynter 1991).

Measurements: (n=3) Zooids: average maximum body length: 65.8µ (59.1µ-74.9µ); average peristome width 14.3µ (11.3µ-18.2µ); average maximum body width 10.6µ (9.1µ-13.6µ); average "head" length 18.2µ; average "head" width 13.6µ; average "neck" width 10.9µ (8.2µ-13.6µ).

Lorica: average length 49.5µ (49µ-52µ); average aperture width 10.9µ (8.2µ-13.6µ); average maximum width 23.5µ (22.7µ-23.6µ); average stalk length 13µ (11µ-12µ).

Pyxicola limbata (Stiller 1933) (Fig. 10)

Freshwater, solitary, loricated peritrich. Zooid with closure apparatus (operculum) beside the peristomal lip. Brownish or dark brown lorica with a short neck softly curved to the side; surface finely granulated. Attached to substratum by means of short stalk. Aperture border typically undulated or denticulated. Maximum width measured in the middle of the case, which narrows towards the stalk. The zooid hardly exceeds the lorical length when fully extended, exposing the peristomal area and operculum. Contractile vacuole located beneath the peristomal lip. Longitudinal band-like macronucleus, longitudinal, extending through most of the zooids length.

Observations: This peritrich was found attached to *Oedogonium* sp. during late winter and summer. The species has been recorded for Tihany (Hungary) (Stiller 1971).

Measurements: (n=3) Lorica: average length 70.4µ (68.2µ-72.7µ); average aperture width 19.3µ (18.2µ-20.4µ); average maximum width 29.5µ; average stalk length 11.3µ (9.1µ-13.6µ); average stalk width 4.95µ (4.5µ-5.4µ).

Thuricola innixa (Stokes 1885) (Fig. 11)

Freshwater loricated peritrich. With valve-like apparatus located inside the lorica, in the anterior third; during contraction of zooid, the valve obliterates the case. Lorica greyish, transparent; cylindrical, narrowing in the lower third. One or two zooids per lorica (usually two). Pellicle finely striated. Peristomal lip well defined. Peristomal disc slightly arched. Contractile vacuole in the upper third of body. Macronucleus band-like, longitudinal, extending through most of body length. Infundibulum short. Zooids attached to lorica by means of short and slender internal stalk; usually one larger than the other.

Observations: This species was found attached to *M. quitense* and *Oedogonium* sp. during all sampling period except autumn. Kahl (1933-1935) indicates that this species was found on submerged macrophytes

from Europe and USA.

Measurements: (n=7) Longer Zooids: average maximum body length: 272.8µ (231.8µ-313.6µ); average peristome width 41.1µ (40.9µ-41.8µ); shorter zooids: average maximum body length: 212.8µ (154.6µ-263.6µ); average peristome width 38.6µ (36.4µ-40.9µ); Lorica: average length 174µ (154.5µ-199.9µ); average aperture width 42.4µ (31.8µ-45.4µ); average maximum width 47.8µ (45µ-54.5µ); base 29.91µ (20.4µ-38.6µ).

Thuricola kellicotiana (Sotkes 1887) (Fig. 12)

Freshwater, loricated peritrich. Lorica vase-like; stalkless, constricted below the aperture. Maximum width of lorica is measured in the middle, narrowing towards the base. Valve-like apparatus positioned in the anterior third of the case. Pellicle smooth or very finely striated. Macronucleus elongated, band-like, longitudinal. Contractile vacuole beneath the peristomal lip. Peristomal disc elevated. Zooid attached to lorica by means of short and slender internal stalk. Cytoplasm hyaline, with numerous greenish digestive vacuoles. Infundibulum short. When fully extended, 1/3-1/2 of zooids length is exposed; very plastic, bending the exposed part of body in exploratory movements. All observed organisms were solitary.

Observations: *Thuricola kellicotiana* was found attached to *Oedogonium* sp. and *Enteromorpha* sp. in summer. It was found on submerged macrophytes and mosses from Europe and USA.

Measurements: (n=3) Zooid: average maximum body length: 199.9µ (140.8µ-259.1µ); average peristome width 43.6µ (40.9µ-46.3µ); average maximum body width 20.4µ (20.4µ-27.3µ); average internal stalk length 14.1µ (10µ-18.2µ); Lorica: average length 183.3µ (140.8µ-209.1µ); average aperture width 36.4µ (36.4µ-40.9µ); average maximum width 45.4µ (40.9µ-54.5µ); base 16.4µ (14.5µ-18.2µ).

Vaginicola attenuata Fromentel 1874 (Fig. 13)

Freshwater. Lorica cylindrical, parallel sided, wide, stalkless, transparent; lower 1/5 narrows abruptly in opposition to the mayor extension of the case, which is very constant in its width. Beneath the aperture with a slight constriction, not always notorious. One or two zooids sharing the abitacule, exposing a small part of the cell (30%) when fully extended. Pellicle smooth. Contractile vacuole beneath the flat peristomal disc. Infundibulum short. Macronucleus band-like, longitudinal, extending through the lower half of body. Cytoplasm hyaline, with digestive vacuoles.

Observations: *Vaginicola attenuata* was found attached to algae (*Oedogonium* sp., *Oscillatoria* sp. and diatoms) in summer. The difference in size may be attributed to different forms of the same species. Smaller individuals where found attached to diatoms and *Oscillatoria* sp., while bigger forms where found attached to *Oedogonium* sp. This species was found previously attached on submerged macrophytes in Germany (Stiller 1971).

Measurements: (n=3) Zooid: average maximum body length: 99.6µ (68.2µ-149.9µ); average peristome width 22.7µ (13.6µ-40.9µ); average maximum body width 13.6µ (9.1µ-22.7µ); average minimum width 5.7µ (4µ-9.1µ); Lorica: average length 93.2µ (59.1µ-127.3µ); average aperture width 36.4µ (27.3µ-45.4µ); average maximum width 36.4µ (27.3µ-45.4µ); base 11.3µ (4.5µ- 8.2µ).

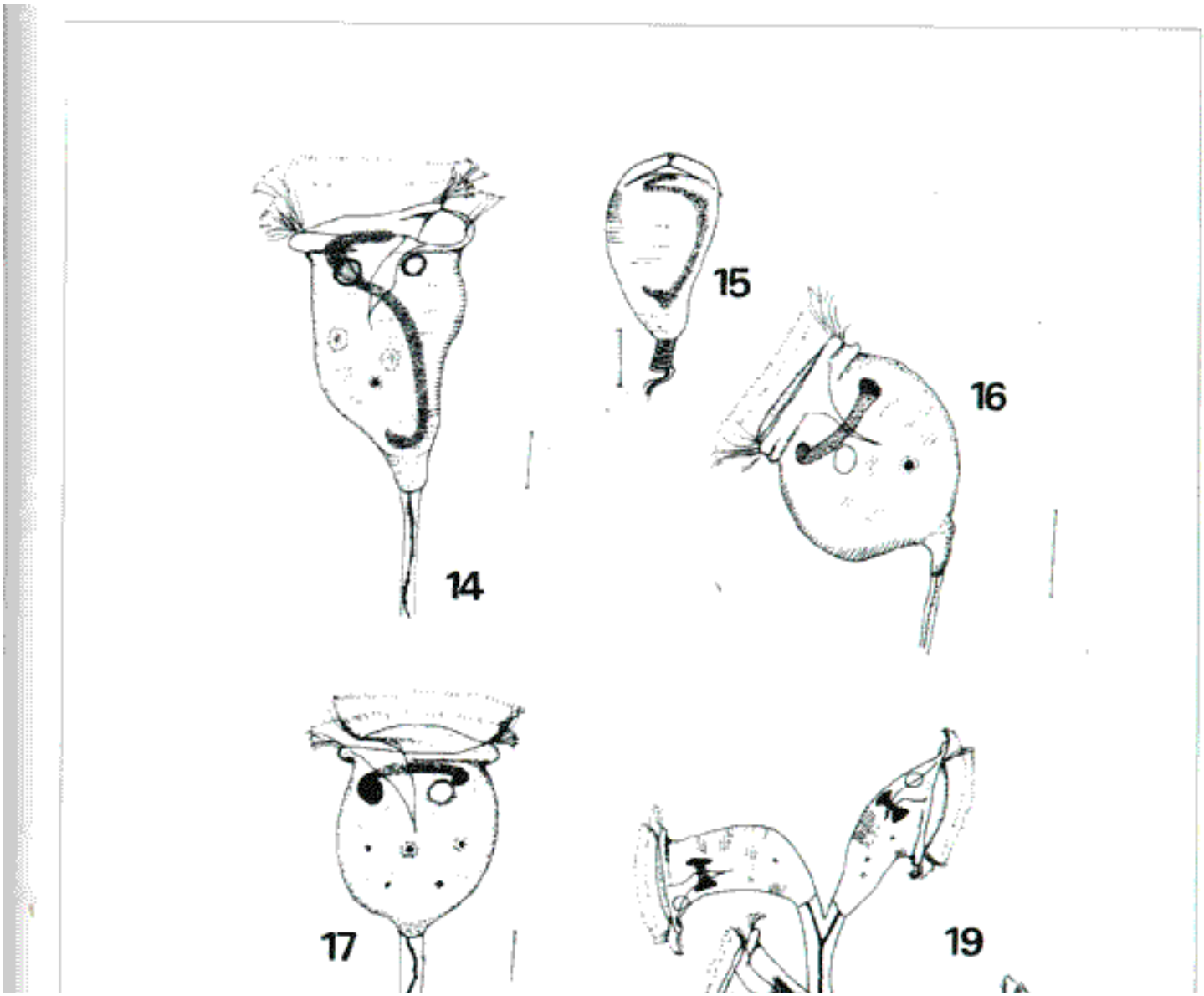
Family Vorticellidae

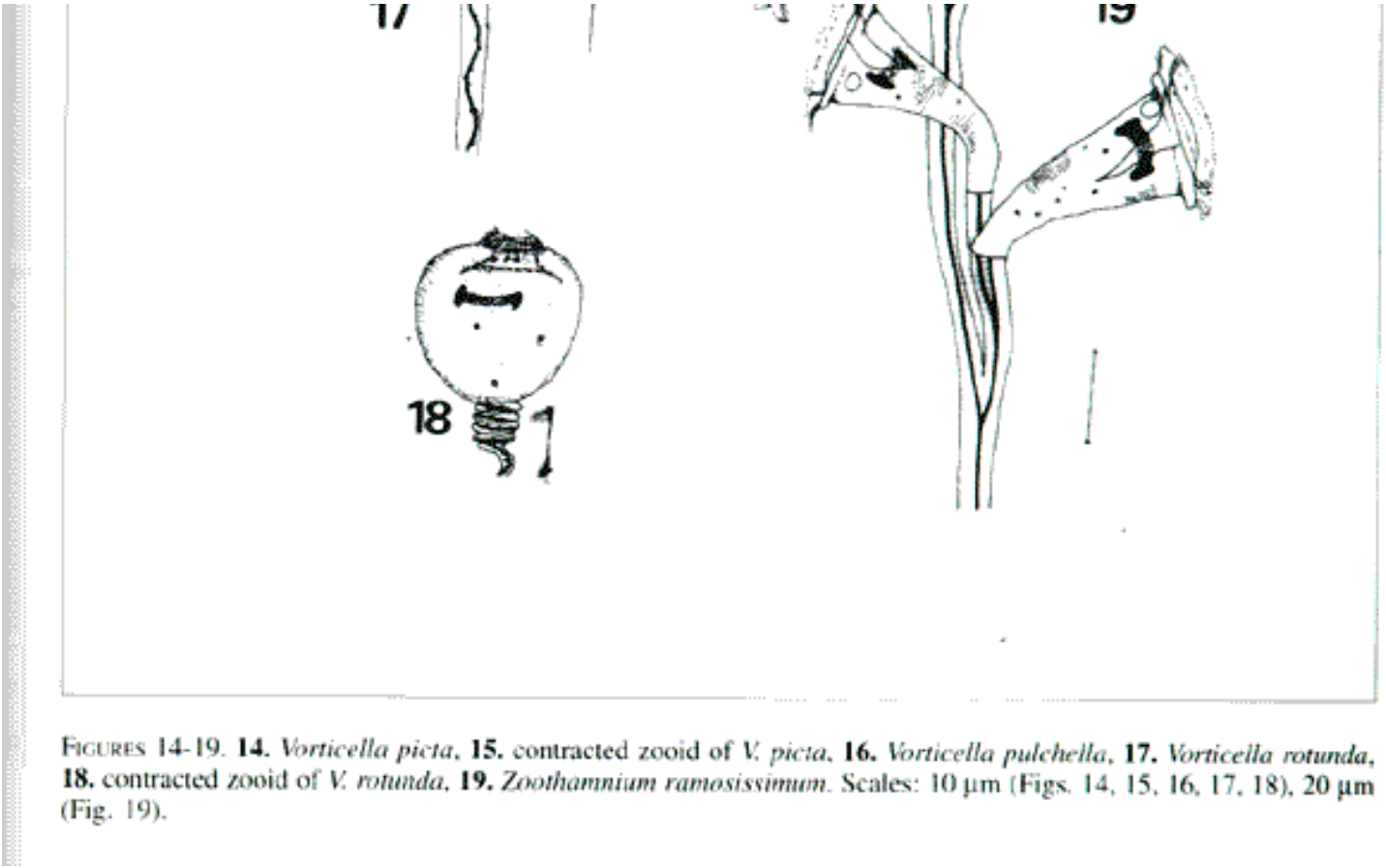
Vorticella picta Ehremberg 1838 (Figs. 14, 15)

Zooid inverted bell-shaped, with irregular sides. Pellicle finely striated. Peristomal disc convex. Infundibulum conspicuous. Two contractile vacuoles located in the upper third of body, beneath the peristomal lip. Macronucleus irregular or "S" shaped, longitudinal. Cytoplasm with abundant greenish digestive vacuoles. Zooid held erect or slightly bent. Spasmosome with green thecoplasmatic granules. Solitary or forming pseudocolonies.

Observations: This peritrich was found in spring and summer attached to *M. quitense*. Sommer (1951) found *V. picta* attached to *Enteromorpha* sp. and *Chladophora* sp. According to Warren (1986) and Noland & Finley (1931), the organisms may present reddish thecoplasmatic granules as well as green ones. Noland & Finley (1931) suggest that these may be different varieties of the same species. According to the observations of these authors, *V. picta* is typical of clear, clean waters. Hammann (1952) mentioned that it feeds on algae and bacteria; this author found this species attached to *Ceratophyllum* sp., *Elodea* sp., artificial substrates (slides) and the gasteropod *Lymnaea* sp. Hatano & Watanabe (1981) found this species attached to leaf litter in Mizutori-no-numa pond, Tokyo, Japan.

Measurements: (n=4) average maximum body length: 53µ (45.4µ-59.1µ); average peristome width 35.6µ (27.3µ-43.2µ); average maximum body width 26.5µ (20.4µ-31.8µ); average stalk length 112.1µ (91µ-122.7µ); stalk width 5µ.





FIGURES 14-19. **14.** *Vorticella picta*, **15.** contracted zooid of *V. picta*, **16.** *Vorticella pulchella*, **17.** *Vorticella rotunda*, **18.** contracted zooid of *V. rotunda*, **19.** *Zoothamnium ramosissimum*. Scales: 10 µm (Figs. 14, 15, 16, 17, 18), 20 µm (Fig. 19).

Vorticella pulchella Sommer 1951 (Fig. 16)

Small, ovoid to globular freshwater peritrich; solitary. Peristomal lip conspicuous; peristomal disc arched. Pellicle with narrow striations; slightly constricted beneath the peristome. Macronucleus "C" shaped, transversal. Infundibulum reaches half of body length. Single contractile vacuole centrally located. Stalk variable in length; spasmosome with greenish thecoplasmatic granules.

Observations: The specimens were found attached to *M. quitense* and debris in spring and summer. The species was originally found as an epibiont to the crustacean *Cyclops* sp. (Sommer 1951) and attached to detritus (Hammann 1952).

Measurements: (n=10) average maximum body length: 26.8µ (18.2µ-31.8µ); average peristome width 18.4µ (13.6µ-22.7µ); average maximum body width 22.7µ (18.2µ-31.8µ); average stalk length 69.6µ (45µ-259µ).

Vorticella rotunda Nenninger 1948 (Figs. 17, 18)

Freshwater, solitary peritrich; inverted bell-shaped or subcircular. Pellicle unstriated. Slightly constricted beneath the peristome. Peristomal disc strongly convex. Contractile vacuole in the upper third of body. Macronucleus "C" shaped, transversal. Cytoplasm hyaline. Spasmosome with few greenish thecoplasmatic granules. Stalk long, up to 8-9 times the zooids length. Upon contraction, cilia are not completely withdrawn into the peristomal cavity.

Observations: *Vorticella rotunda* was found attached to *M. quitens*e in winter. The species was originally found as an epibiont attached to the dragonfly *Lestes virens* (Nenninger 1948) and to the crustacean *Asellus aquaticus* (Cook *et al*. 1998).

Measurements: (n=6) average maximum body length: 42µ (31.8µ-49.9µ); average peristome width 31.4µ (27.3µ-34.1µ); average maximum body width 32.8µ (29.5µ-36.4µ); average stalk length 266µ (190.8µ-363.6µ).

Family Zoothamniidae

Zoothamnium ramosissimum Sommer 1951 (Fig. 19)

Freshwater colonial peritrich. Zooids conical or funnel-shaped; positioned in angle in relation to the stalk. Maximum width measured across the peristomal lip. Pellicle finely striated. Cytoplasm hyaline, with numerous digestive vacuoles in the upper 2/3 of body. Peristomal disc slightly arched, convex. Infundibulum reaches half of zooids length. Macronucleus "C" shaped, transversal, across the middle of infundibulum. Contractile vacuole beneath the peristomal lip. Spasmoneme continuous. Zooids positioned at different heights in the colony, with 10-15 individuals. During contraction peristome withdraws and acquires "snout" shape.

Observations: *Zoothamnium ramosissimum* was found attached to *M. quitense* in summer. Sommer (1951) originally found it in German lakes attached to *Enteromorpha intestinalis*, *Cladophora* sp., *Lemna* sp., *A. aquaticus* and insect larvae. According to this author, the stalk may range between 110µ and 570µ in length.

Measurements: (n=6) average maximum body length: 58.4µ (54.5µ-63.3µ); average peristome width 32.7µ (31.8µ-36.3µ); average minimum body width 8.2µ (6.8µ-9.1µ); average stalk length 510µ; colony length 582.8µ.

DISCUSSION

These findings can be considered relevant because the knowledge of Argentina ciliate fauna increases. The distribution of certain species previously known just for the Northern Hemisphere is expanded to the Neotropical region.

The peritrich fauna found in the San Miguel del Monte pond have markedly seasonal distribution, being summer the period with major diversity (Foissner *et al.* 1999). Temperature is considered to be determining for the presence of the species since food source (bacteria) was abundant around the year (Zaleski & Claps 2000). Based on our observations, we conclude that *V. picta* is quite a thermophilous species (it was found between 20-26 ºC) and is not limited by low dissolved oxygen concentrations, since it was found with values ranging 1-10 mg l^{-1}.

A difference in the choice of substrates was observed. The smaller peritrichs had the tendency to colonise smaller substrates (diatoms, filamentous algae) while the bigger species were found on more solid ones (macrophytes). This phenomenon could be attributed to a competition during colonisation.

Cohturnia annulata was the less selective species, being present around the year and attached to different substrates.

Epistylis tubificis was found attached on different substrates when this species is considered an epizioc *sensu stricto* in the Northern Hemisphere.

Organic pollution can be poorly diagnosed with these specie because only four are included in the Sladecek's saprobic system (1973): *V. picta* as oligosaprobic, *C. annulata* as oligo- ß mesosaprobic, *E. hentscheli* and *T. kellicotiana* as ß-amesosaprobic species.

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